13 PROJECT CONFIGURATION MANAGEMENT

13.1 OVERVIEW

Successful accomplishment of a project requires that all participants be provided accurate information on the project and its end product(s) during any point in the project life cycle. As a project proceeds through its life cycle, the number of participants grows significantly and the volume of information grows exponentially. The task of managing this information is a major challenge and essential to project success.

In the early stages of a project's life cycle, the end product(s) are defined by functions and requirements contained in mission need and conceptual design documentation.

As the project progresses through the its cycle, functions and requirements are expanded to develop design requirements for functional and physical configuration of the end product(s). These design requirements, in turn, are expanded to the detail required to construct, operate, and maintain the end product(s).

Configuration management helps to ensure an orderly process for the control of changes to those products as they evolve through each project phase. Product configuration may be verified at any stage of the process that enables management decisions to be made on current information. Proposed changes may be better evaluated for impacts. Data retrieval is faster and project personnel are more confident in that data, enabling faster, more cost-effective control practices. Historical data should be more readily available, which should result in more accurate estimates on the current project as well as on future projects that may use the data.

The activities that constitute the configuration management discipline include:

- Planning and Management
- Configuration Identification
- Change Management

- Status Accounting
- Audit

13.2 PURPOSE

Configuration management is used to ensure and document that all facilities, structures, systems, subsystems, and components, as well as supporting documentation of a project, interface physically and functionally. This process must also ensure that the configuration is in agreement with the performance objectives in the technical baseline. Configuration management is a critical component of the Integrated Safety Management System and the maintenance program. The project manager must initiate a configuration management system early in the development of the project and must assure the delivery of as-built documents at the close of the project. Configuration management control begins with baselining of requirements documentation and ends with decommissioning of equipment in the operational facility.

Configuration management principles are used in each project phase to some degree. These principles are to be tailored to fit the phase as well as the product application to an appropriate degree as determined by project team personnel.

13.3 CONFIGURATION MANAGEMENT APPLICATION

13.3.1 Scope

The configuration management discipline shall be applied to all project hardware, software, firmware, documentation, test and support equipment, facility space, spares, training, and manuals. A change control system shall ensure that documentation associated with an approved change to a project's configured system is updated to reflect the appropriate baseline. Affected documentation may include training materials, courseware, and other integrated logistic support documentation.

13.3.2 Configuration Management and Baseline Management

Within DOE, the terms "baseline management" and "configuration management" have been used with some degree of confusion. The purpose of this section is to clarify the relationship.

Configuration Management—at any point in its life cycle, from planning to completion of the execution phase, a project has a configuration. Initially, its configuration is a conceptual arrangement of the parts or elements of the desired end product(s). As the project proceeds through its life cycle, the configuration is defined in greater detail through the design process and documented in specifications and drawings. At the end of the life cycle the configuration is the actual physical and functional configuration of the end product(s) as reflected in as-built documents. Configuration management is used to identify and document the configuration of the end product(s) and control changes to the configuration during the life cycle.

Baseline Management—at selected points in a project's life cycle, the current configuration is established as a reference point or technical baseline. The technical baseline is combined with other project activities (e.g., activities to construct or activities to conduct remedial action) to form a scope baseline. The scope, schedule, and cost baselines serve as a basis for project authorization, management, and an approved basis for measurement during project performance. As such, the scope, schedule, and cost baselines are the established plan or performance baseline against which the status of resources and the progress of a project are measured. Baseline management is used to measure progress and control baseline changes.

Configuration management and baseline management are integrated in that the baselines are derived from the same configuration and they often share a common change control process.

13.3.3 Configuration Management Processes

All projects shall perform to the planning, identification, change control, status accounting, and verification and audit activities described as follows:

1. *Configuration Management Planning and Management*
   This activity includes planning, coordinating, and managing all tasks necessary to implement configuration management principles and to conduct configuration management activities. Configuration management planning and management occurs throughout all project life-cycle phases. Documentation of the planning process and development of the configuration management plan and supporting procedures formalizes involvement and ensures continuity of configuration management practices at all levels of management. Training personnel commensurate with their roles and responsibilities is an ongoing

requirement. Periodic assessment of process performance needs to be performed to allow for improvements to the configuration management process.

2. Configuration Identification
   Projects shall identify configuration items and shall develop appropriate configuration documentation to define each configuration item. This activity includes the development of a product top-down structure that summarizes the total units and configuration documentation for the system or configured item. Identification also includes the assignment of unique identifiers, that identify units, and groups of units, in a product. Configuration identification and product information shall be maintained and readily available to all project participants. Baselined documentation shall be maintained with all necessary links to the information management system. Supporting documentation includes the numbers and other identifiers (e.g., document numbers, drawing numbers, equipment numbers) assigned to configuration items and documents, and the approved technical documents that identify and define configured items' functional and physical characteristics, such as specifications, drawings, and interface control documents and associated lists.

3. Configuration Change Control
   Projects shall implement a systematic and measurable change process that is consistent with DOE O 413.X, and shall document it in their approved Change Control Boards' charters and operating procedures. The implemented change process shall ensure proposed change are properly identified, prioritized, documented, coordinated, evaluated, and adjudicated. Approved changes shall be properly documented, implemented, verified, and tracked to ensure incorporation in all involved systems, equipment and spares.

4. Configuration Status Accounting
   Projects shall develop and maintain configuration information for their configured items or products in a systematic and disciplined manner in accordance with DOE policy and accepted configuration management process and procedures. Status accounting information includes developing and maintaining site or project configured data, and the incorporation of modification data on systems and configuration items. This configuration information must be available for use by decision-makers over the lifecycle of the project. It will also provide an audit trail of change proposals, current baselines, and historic baselines. Data availability and retrievability shall be consistent with the needs of various users.

5. Configuration Verification and Audit
   The configuration management process shall verify that a product's requirements have been met and the product design meeting those requirements has been accurately documented before a product configuration is baselined. Verification takes the form of a functional configuration audit and a physical configuration audit. The functional configuration audit provides a systematic comparison of requirements with the results of tests, analysis, or inspections. The physical configuration audit determines whether the product is consistent with its design documentation. In addition, operational systems must be periodically validated to ensure consistency between a product and its current baseline documentation. Verification of the incorporation of modifications is a critical function of this activity. This validation includes verification of facility baselines and conduct of system audits at project acceptance and turnover. Audit discrepancies will be identified, recorded, and tracked to closure.

13.3.4 Technical Baseline Identification

As discussed in Section 13.3.2, the technical baseline is combined with other project activities to form the scope baseline. The scope baseline is the basis for cost and schedule baselines. The technical baseline defines the physical and functional configuration of the project's end product(s). Baseline management controls the scope, schedule, and cost baselines, and integrates with configuration management which controls the technical baseline. Data management controls project information and the configuration of its end product(s).

The technical baseline consists of a top-down set of requirements in which all subsidiary requirements flow down from the requirements above them. Typical DOE technical baselines are defined below. For identification and reference purposes, each update to the technical baseline has been given a title corresponding to its content and/or relationship in the life cycle.

The titles of the baseline may vary for a particular program or project, and there may be fewer or more baselines. A minimum set of technical baselines would be those required to support scope, schedule, and cost baseline submittals for Critical Decisions.

Functions and Requirements Baseline. The initial baseline for a project is developed during the conceptual phase and supports the Approve Preliminary of Baseline Range Critical Decision. It establishes the functions and technical requirements of DOE programs and projects. At this early stage of a project, the

configuration represented by the baseline is conceptual with nothing designed or built. The functions and requirements baseline is generally developed from the mission need and mission objectives.

Design Requirements Baseline. For complex projects, the design portion of the execution phase is often divided into preliminary design and final design. Through the preparation of preliminary planning and engineering studies, preliminary design translates the functions and requirements from the conceptual phase into preliminary drawings and outline specifications, life-cycle cost analysis, preliminary cost estimates, and schedules for project completion. Preliminary design identifies long-lead procurement items and provides analysis of risks associated with continued project development. At this stage of a project, the configuration defined by the preliminary drawings and outline specifications is represented by the design requirements baseline with the following content identified:

- Physical systems for each project or facility
- Boundaries and interfaces for each physical system
- The major components for each physical system
- The functions and requirements, performance criteria, and constraints established in the conceptual phase allocated to the respective physical systems and major components.

Configuration Baseline. This represents the output of the final design portion of the execution phase and supports CD-3, the Approve Start of Construction or Remedial Action. The functions and requirements from the conceptual phase and the design requirements from preliminary design, as applicable, are expanded to include the detail required to construct the components and systems of the end product(s). The configuration of the project is defined by the design output documents which include procurement and construction specifications, drawings, test procedures, and operating and maintenance information.

As-Built Configuration Baseline. At CD-4, Approve Start of Operations or Project Closeout (complete execution phase), the detail design documents established in the configuration baseline are used to establish the as-built configuration baseline as follows:

- All changes occurring to the configuration baseline during construction are approved and reflected in the as-built configuration baseline.

- All changes occurring to the configuration baseline during the operations phase (after system turnover) are approved and reflected in the as-built configuration baseline. This baseline exists and is maintained current throughout the operations phase.

13.3.5 Establishment of Baselines

Development of baselines for DOE programs, projects, and operating facilities should adhere to the following management concepts set forth by DOE O 430.1:

- Identification, documentation, and approval of basic requirements
- Specification of a systematic process for baseline development
- Formal identification and approval of baselines
- Specification of allowed variances from the approved baseline
- Regular reporting and assessment of status against the approved baselines
- Corrective management action (that may include baseline revision) in the event a variance exceeds a prescribed threshold.

13.3.6 Change Control Boards (CCB)

A hierarchical arrangement of relatable flow-down Change Control Boards shall be established by Headquarters, the respective field office, and the contractor to establish configuration management baselines and to approve/disapprove subsequent changes to those baselines. Each project board shall have an approved charter and operating procedures. Proposed changes to HQ's configuration management baselines must be submitted to the appropriate change control board on an agency approval change request form. Each Change Control Board shall document its approval/disapproval decisions. The number of boards and their specific charters and procedures will be tailored to the particular project. The intent shall be to maintain the vast majority of control actions at the contractor level.

Change Control Board charters and operating procedures shall be maintained to reflect the addition of new programs, the additions/deletions of configuration items, and changes to Board membership.

13.3.7 Energy Systems Acquisition Advisory Board

MS Project ESAABs

The ESAAB advises the SAE in making MS project CDs, Level-0 baseline changes, and site selections for facilities for new sites. The ESAAB meets once every two months, or at the call of the SAE.

ESAAB membership includes the SAE as chair; the Under Secretaries; the General Counsel; the Chief Financial Officer; the Director of OECM; the Assistant Secretary for Environment, Safety and Health; the Assistant Secretary for Environmental Management; the Deputy Administrator for Defense Programs; the Director for Office of Science; and the Director of Procurement and Assistance Management. The Deputy Secretary may designate other PSOs or functional staff as board members as needed.

The ESAAB Secretariat resides in OECM and provides administrative and analytical support and recommendations to ESAAB.

Other Project ESAABs

Each appropriate PSO appoints an ESAAB-equivalent board for advising on actions regarding those projects within the PSO office that are not MS projects. The PSO serves as AE for these projects and as chair of the ESAAB-equivalent board. The ESAAB-equivalent board replicates and the same functions as those performed by the corporate ESAAB. Members may be selected from within the PSO's office or from other Headquarters functions having Departmental responsibility. At least one member is from a different PSO office and is designated by the contributing PSO. OECM provides a member of each ESAAB-equivalent board for projects $100M and greater. Each PSO provides the composition of its ESAAB-equivalent board to OECM. Agendas and minutes of all ESAAB-equivalent boards are provided to OECM.

Delegated Other Project ESAABs

The PSO may delegate equivalent AE functions, including decision approvals, for those Other Projects below $100M to an SES program manager or an operations/ field office manager. For those delegated Other Projects below $20M, the Pro-

gram Manager or O/FOM may further delegate equivalent AE functions to a direct reporting SES subordinate. Attachment 3 provides an overview of the allowable AE delegations. The AE so designated establishes and chairs an ESAAB-equivalent board, notifies OECM of its composition, invites OECM to all board meetings, and provides all agendas and minutes to OECM and the appropriate PSO project management support office. However, OECM is not a board member.

13.4 PROJECT CONFIGURATION MANAGEMENT POLICY

Each project shall be responsible for:

- Developing and implementing configuration management plan(s) and processes.
- Life-cycle management of products/solutions assigned to their Change Control Board.
- The inclusion of appropriate configuration management principles in all acquisition contracts.
- The timely approval/disapproval of proposed changes to configured items under their purview for the lifecycle of the items.
- Analyzing changes completely and coordinating changes that impact other configured items within the project.
- Referring proposed changes that exceed their approval authority to the next higher board.
- Establish baselines for all system that are operational or that are scheduled for operation. The baseline process begins with establishment of the system/subsystem functional baseline and concludes with the establishment and maintenance of the project baseline. Establishing and documenting site configurations and creating baseline documentation shall be included in this responsibility.
- Providing the user organization with detailed documentation describing the operational baseline at the time of commissioning. This documentation consists of the contractually agreed to as-built lists, updated to reflect the configuration at the time of commissioning, and the serialization/revision/version status of all hardware, software, and firmware. This documentation is in addition to the functional, allocated, and product configuration documentation. Providers must

also ensure that operations and field offices receive the contractually provided manuals. Documentation describing the operational baseline must be maintained as long as the system is operational.